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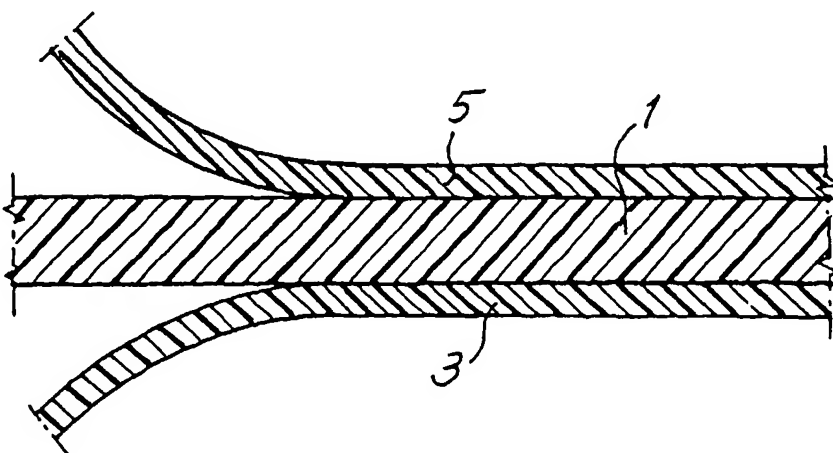
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(54) Title: FILM MADE OF THERMOPLASTIC RESIN, WHICH MAY BE USED FOR PACKAGING FOODS



(57) Abstract: The film consists of an internal thickness made of polyvinyl chloride (PVC) with plasticizers also of the phthalate type, co-extruded with two thin external thickness of non-toxic synthetic resins - for instance stretchable polystyrene (PS) or ethylene/vinyl acetate (EVA) or other thermoplastic materials that are also impermeable to gases - and which are capable of blocking the transmission of particles present in the PVC.

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FILM MADE OF THERMOPLASTIC RESIN, WHICH MAY BE USED FOR PACKAGING FOODS.

DESCRIPTION

The wrapping or packaging of fresh products – such as meat, cheese,
5 fruit, vegetables and various other products – in supermarkets and in
prepackaging centers, has been performed hitherto using a stretchable
plasticized PVC (polyvinyl chloride) film, which is applied onto trays made of
polystyrene, wood pulp and similar containers made of rigid plastic.

Stretchable PVC film is known as “stretch film” or “cling film”.

10 To obtain the correct physicochemical and mechanical properties for
the stretchable PVC film, it is necessary to add to the PVC-based
thermoplastic resin many other chemical substances, for instance stabilizers,
lubricants, plasticizers, etc. The “compounds” thus obtained are then extruded
15 using systems known in the industry, performed by various extrusion
techniques from the top downwards or vice-versa. All these systems have
been known for a long time to those skilled in the art.

Recently, the problem has emerged of plasticizers in general and
phthalates (DOP and the like) in particular, which appear to be carcinogenic.
These substances migrate from the film to the wrapped product and this may
20 be hazardous to the health of consumers.

Italian and European law has recently banned the use of these types of
plasticizers. The producers of these films adapted to the legislative provisions
by varying the nature of the plasticizers, but this does not alter the fact that
these substances also – which appear to be recognized as non-toxic – can
25 still migrate into the wrapped product, transferring substances which are at
the very least foreign to the packaged food and which may therefore be more
or less harmful. The film is therefore not inert.

The aim of the present invention is to keep the PVC film still stretchable
and thus suitable for use, but make it inert, that is to say prevent the transfer
30 of foreign substances to the packaged food.

Numerous attempts have been made hitherto to achieve this aim by
those skilled in the field of plastics engineering, by replacing stretchable PVC

film with stretchable PE (polyethylene) film, sometimes using co-extrusion systems in two or more layers, and even up to five layers, in addition to mono-extrusion; however, no positive results have been achieved to date. This may be due to the nature of the plastic materials used, the lack of mechanical or chemical properties, for instance the correct and equilibrated permeability to CO₂, O₂ and H₂O, and also the lack of elastic memory and rupture strength of the film. Problems relating to the use of automated, semi-automated or even manual machines have also emerged.

Essentially, the subject of the invention is a stretchable film made of synthetic resin, which can be used for packaging foods, characterized in that it comprises an internal thickness made of polyvinyl chloride (PVC) with plasticizers that may be of the phthalate type, and thin external thicknesses made of non-toxic thermoplastic synthetic resins and the like to block the transmission of particles present in the PVC. Said thin external thicknesses may consist of substances included in the group comprising polystyrene (PS), ethylene/vinyl acetate (EVA), polyethylene (PE), ionomeric resins (Surlyn), polybutadiene, "K" resins and the like, and also resins such as Barex, EVOH, Nylon, etc. capable of making the film impermeable to gases so as to allow the product to be wrapped under vacuum or in a modified atmosphere to keep the wrapped product fresh for longer.

Thus, according to the invention, it has been envisaged to maintain the predominant presence of PVC with the chemical and physical properties that are intrinsic to this material and – to overcome the problems of transfer of the substances added to the PVC resin (which would migrate directly from the film to the wrapped product, and to maintain the particular properties of the stretchable PVC film – to co-extrude, in a bubble or with a flat die, the stretchable PVC film with another two (minimum) layers outside the PVC, made of other thermoplastic materials, for instance polystyrene (PS), ethylene/vinyl acetate (EVA), ionomeric resins such as "Surlyn", polybutadiene, "K" resin and various others, which block the migration of particles present in the PVC and which are non-toxic.

Advantageously, the co-extrusion must be of at least three layers

since, otherwise, the problem of transfer would not be eliminated; it is essential that the stretchable PVC film must be in an internal structure, and thus isolated.

Basically, it is necessary to achieve a sandwich structure, with the PVC
5 on the inside and in a sufficient thickness to provide the physicochemical properties intrinsic thereto, especially the stretchability, and with external thicknesses of inert and non-hazardous resins.

Co-extrusion with three or more layers may be envisaged, which may be carried out as for normal extrusion, either from the top downward or,
10 conversely, from the bottom upward.

A number of construction schemes are attached as illustrative solutions.

With this arrangement, the mechanical properties of the film are maintained unaltered, these properties being intrinsic to PVC – especially the
15 elastic memory, the stretchability, the rupture strength and the chemical properties, for instance the equilibrated permeability to atmospheric agents. In this way, it is also possible to use the commercially available range of machines. However, with this arrangement, the wrapped product – such as meat, cheese and the like – remains free of foreign substances, which cannot
20 be transferred from the PVC packaging film, due to the isolation provided by the two external layers of the sandwich.

The film with three or more layers may be suitably supplemented with “antifog” substances, so as to make the multiple film totally transparent.

The PS/PVC/PS structure may also be used in automated or manual
25 machines, with a particular type of sealer which is already the subject of another previous patent (Italian patent application No. FI2000A000161 of July 11, 2000) from the same inventor.

Besides the condition of being a stretchable film, a plasticized PVC-based film of this type may also be produced with heat-shrinkability
30 properties, again constructed with a minimum of three layers, with the “two-bubble” system – the invention consists in obtaining a stretchable film by co-extrusion of three or more layers, in which the main layer is made of

plasticized PVC.

In the drawing,

Fig. 1 shows, on a very enlarged scale, a film made according to the invention;

5 Figs. 2 and 3 are sketches of construction schemes for producing a film according to the invention, of stretchable and heat-shrinkable type.

In Fig. 1, 1 indicates the internal thickness of stretchable polyvinyl chloride (PVC) with various additives including plasticizers that may be of the phthalate type, for instance dioctyl phthalate (DOP), and 3 and 5 indicate two
10 thin layers of EVA stretchable polystyrene (PS). The layers 3 and 5 may also be made of other synthetic resins, which may be identical or different.

Fig. 2 shows a scheme of a plant with a co-extrusion die 11, of which 13 indicates two of the three or four or more extruders that feed this die. The bubble B1 being produced downward passes between two rollers 15 and may
15 be collected by a rotating unit 17 to make a stretchable film. On the other hand, to obtain a heat-shrinkable film, the material in film form is conveyed along a path P1 to an oven 19, and is then collected in an essentially identical manner.

Fig. 3 shows a scheme of a plant with an extrusion die 111, of which
20 113 indicates one of the extruders feeding it. The bubble B2 is produced upward to reach a set of rollers 115, after which the material may be collected as a stretchable film at 117, or diverted into the path P2 leading to an oven 119, after which the heat-shrinkable film is collected. The same path may be envisaged to collect the stretchable film without running the oven.

25 A heat-shrinkable film may also be prepared by the "two-bubble" system.

It is understood that the drawing shows merely one illustration given purely as a practical arrangement of the invention, it being possible for the invention to be modified in its forms and arrangements without, however,
30 departing from the scope of the underlying concept of the invention.

CLAIMS

1. Stretchable film made of synthetic resin, which can be used for packaging foods, characterized in that it comprises an internal thickness made of polyvinyl chloride (PVC) with plasticizers that may be of the phthalate type, and thin external thicknesses made of non-toxic thermoplastic synthetic resins and the like to block the transmission of particles present in the PVC.
2. Film according to claim 1, characterized in that said thin external thicknesses consist of substances included in the group consisting of polystyrene (PS), ethylene/vinyl acetate (EVA), polyethylene (PE), ionomeric resins, polybutadiene, "K" resins and the like.
3. Film according to claims 1 and 2, characterized in that it consists of PS-PVC-PS.
4. Film according to claims 1 and 2, characterized in that it consists of PS-PVC-EVA.
5. Film according to claims 1 and 2, characterized in that it consists of EVA-PVC-EVA.
6. Film according to claims 1 and 2, characterized in that it consists of PE-PVC-PE.
7. Film according to claims 1 and 2, characterized in that it consists of PE-PVC-PS.
8. Film according to claims 1 and 2, characterized in that it consists of PE-PVC-EVA.
9. Film according to at least one of the preceding claims, characterized in that it is obtained by tubular co-extrusion.
10. Film according to at least one of the preceding claims, characterized in that it is co-extruded with barrier materials such as EVOH, Barex, Nylon, etc., and optional adhesives.
11. Film according to at least one of the preceding claims, characterized in that it is made heat-shrinkable by the "two-bubble" system.
12. Plant for producing a film according to one of the preceding claims.

Fig. 1

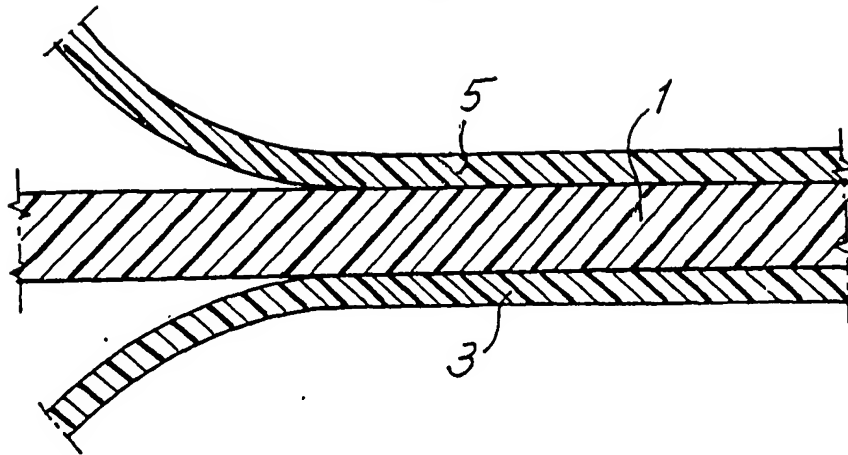


Fig. 2

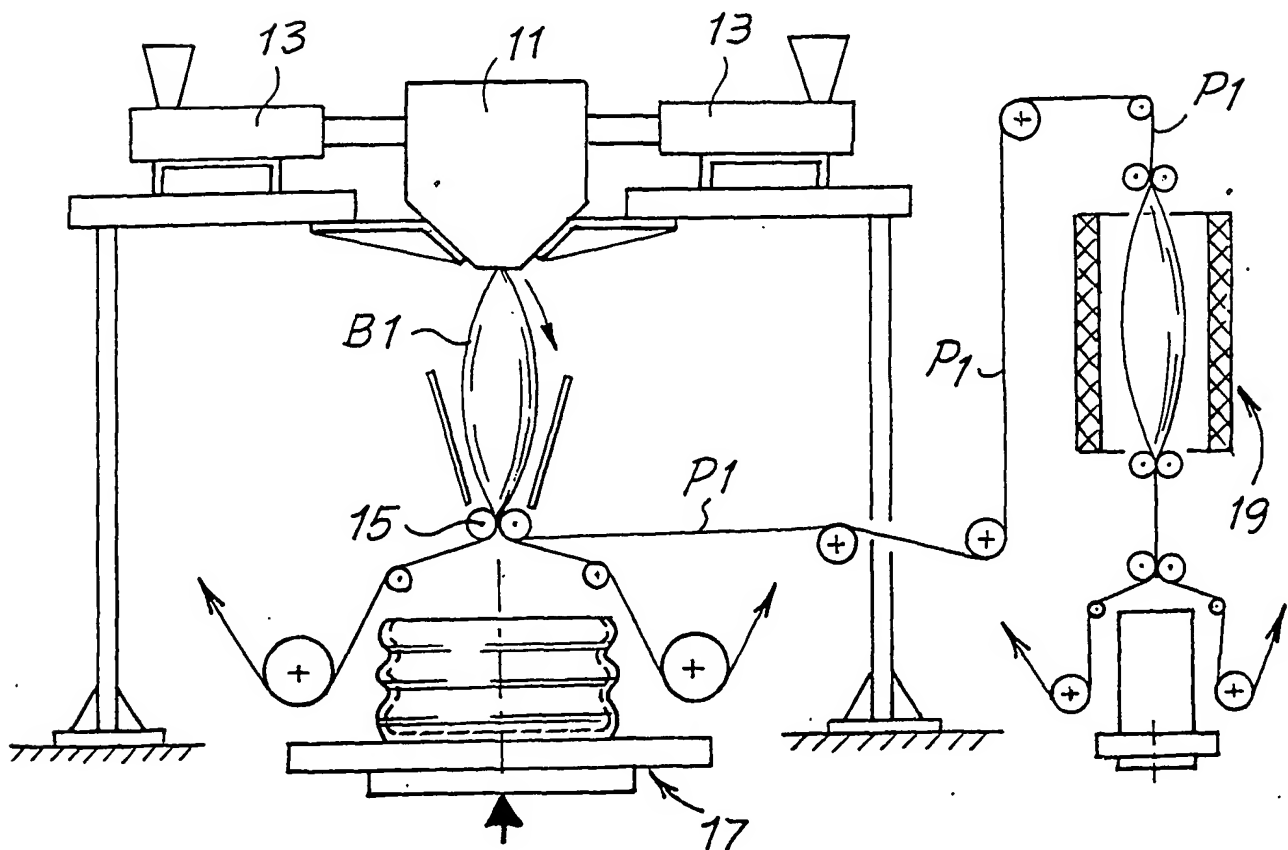
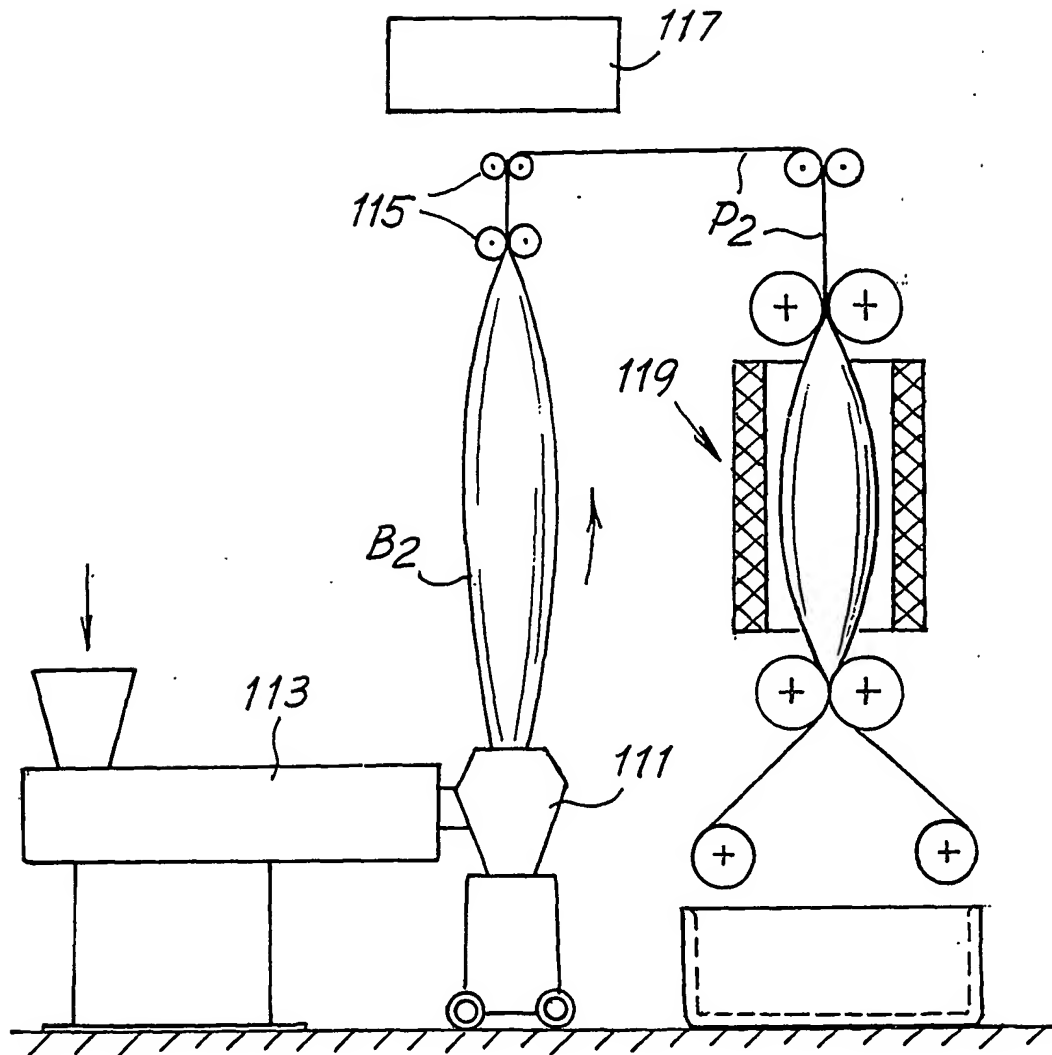


Fig. 3



INTERNATIONAL SEARCH REPORT

Internat application No
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IPC 7 B32B27/30 B32B27/08

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 B32B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the International search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4 855 181 A (SHIMO HIROYUKI ET AL) 8 August 1989 (1989-08-08) column 2, line 31 - line 44 column 4, line 16 - line 21 column 4, line 54 - line 56 column 4, line 61 - column 5, line 2 column 5, line 46 - line 48 examples 1-4 claims 1,5 --- -/--	1-12



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

* Special categories of cited documents:

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Date of the actual completion of the international search

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INTERNATIONAL SEARCH REPORT

International Application No

PC 02/00297

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	<p>US 6 214 477 B1 (ROBERTS WILLIAM P ET AL) 10 April 2001 (2001-04-10) figure 2 column 1, line 6 - line 8 column 1, line 35 - line 55 column 3, line 13 - line 19 column 3, line 40 - column 4, line 12 column 4, line 43 - line 64 column 5, line 15 - line 23 example 7 claims 1-4, 16</p> <p>-----</p>	1-12

INTERNATIONAL SEARCH REPORT

Information on patent family members

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